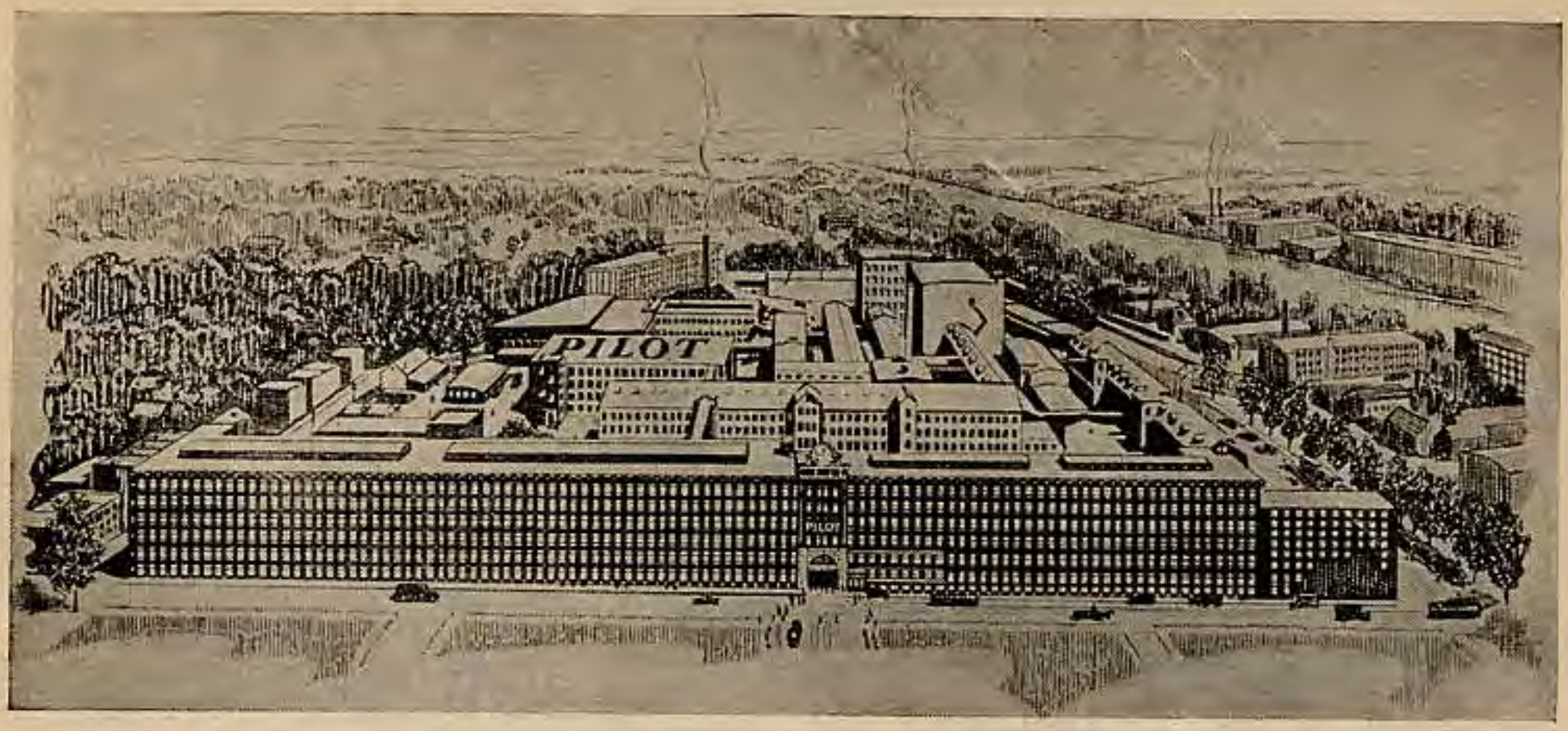


This group of buildings comprises the new Pilot plant. The main building is equivalent in length to about five ordinary city blocks.

Pilot Moves Into A New Home

Takes Over Modern Factory at Lawrence, Mass., Having Floor Space of 1,500,000 Square Feet. Increased Production Will Take Care of Radio Fans' Needs.

By ALFRED A. GHIRARDI

TWENTY-TWO years of electrical and radio parts manufacturing experience has brought the organization which is at present known as the Pilot Radio & Tube Corporation to unquestionable leadership among all radio factories of the world. Since 1908, Pilot has grown from a tiny shop, a one-man outfit, into a great industrial organization specializing in radio parts and equipment and doing business all over the world. The two whirring bench drills that comprised the most important equipment in the original shop in 1908 have become roaring batteries of automatic machines, ranking with silently powerful rows of hydraulic Bakelite presses. The tiny shop of 1908 has given place to increasingly larger quarters, the latest acquisition being a tremendous plant in Lawrence, Mass., having a floor space of a million and a half square feet.

Where once the Pilot name was known to only a handful of radio experimenters, Pilot equipment is now sold in every city throughout the world that is within range of a broadcasting station. Truly, the story of the growth of this concern makes one of the most fascinating chapters of the growth of the radio industry in the United States.

BROOKLYN PLANT INSUFFICIENT

The tremendous demand for Pilot parts and Pilotron tubes which the radio season of 1929-30 brought on made it evident that the space available in the plant in Brooklyn, N. Y., would not suffice to keep up with the ever-increasing business of the company. Consequently larger quarters were sought, and a plant particularly suited to the manufacture of radio parts, tubes, and sets was finally found in Lawrence, Mass. This plant is of modern construction, and affords complete daylight conditions throughout for the many delicate manufacturing and assembly operations required in the manufacture of radio parts and tubes. The new plant contains approximately one and a half million square feet of usable floor space. While we realize that cold floor-space figures do not have much significance for the average layman, a glance at the accompanying photographs will give some idea of a few of the departments in the new plant, and

the equipment and facilities which the Pilot company now has at its command.

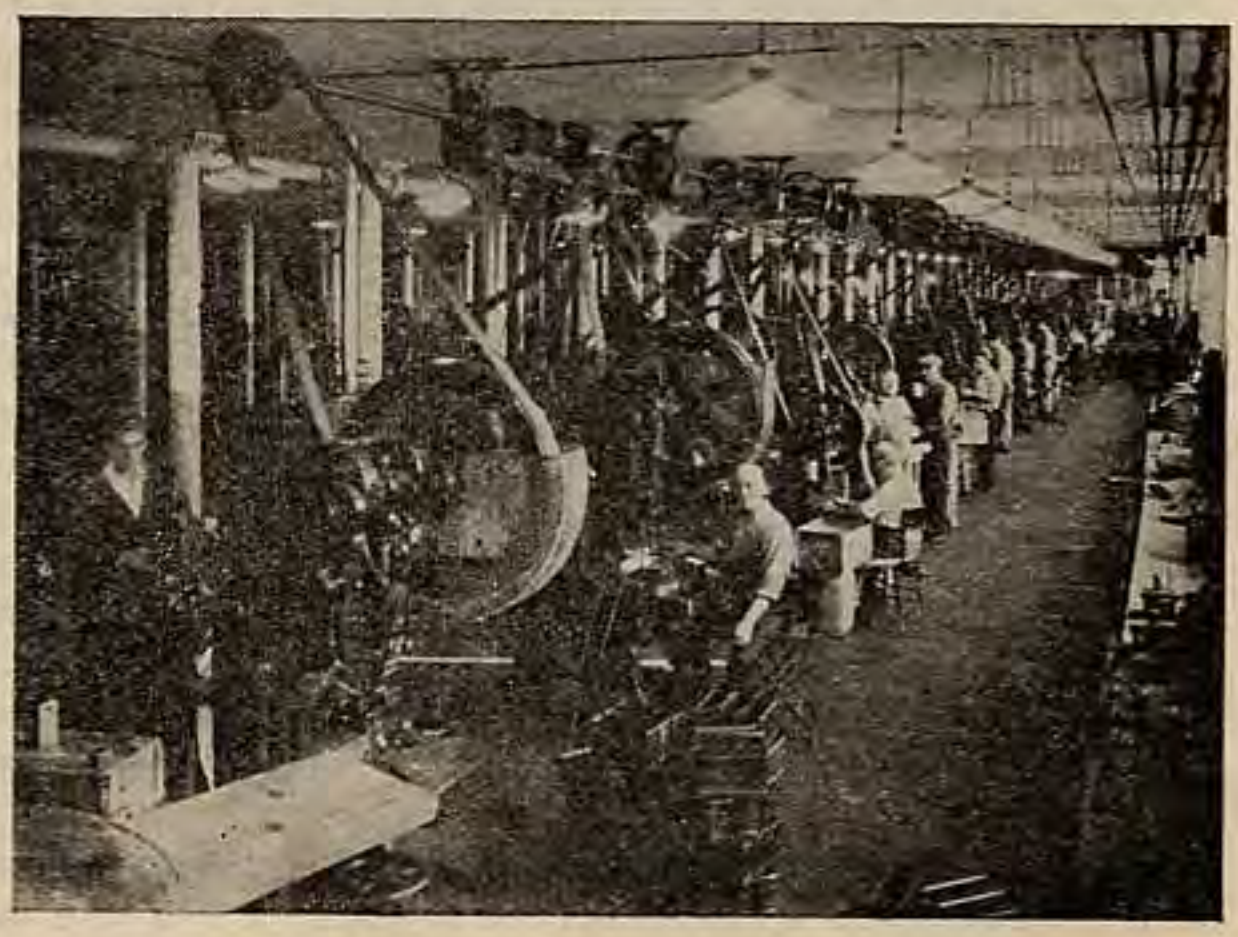
One of the secrets of the Pilot leadership in radio manufacturing has always been continued engineering development of apparatus produced under control of scientific precision manufacturing methods. The accuracy with which the various parts are turned out by the machines depends in a great measure on the accuracy of the various tools, dies, fixtures, gauges, etc., employed in the various manufacturing operations. To insure direct control and proper accuracy and care in the making of these articles the Pilot company maintains a large tool department in which only the most modern machines are employed. These are under the supervision of men who have been especially trained by their long experience with the company for the exacting requirements of this particular work. The illustration, Fig. 1, shows a view of one end of the tool room.

All the special dies, tools, and molds used in the screw machine, stamping, and molding departments are made in the Pilot tool room. This applies also to forming dies for transformer cases, condenser shields, power pack cans, set panels and shields, and containers for filter and by-pass condensers. Many of these dies represent the highest grade of ingenuity and workmanship known in the die-making art. It is due to them that the various Pilot parts can be accurately produced in large quantities at such low prices.

The tool room is also called upon to build the many special machines which are developed by the Pilot engineering staff. Among these are the special machines used in winding power-pack resistors, winding paper condensers, assembling Resistograds, rheostats, dials, etc.

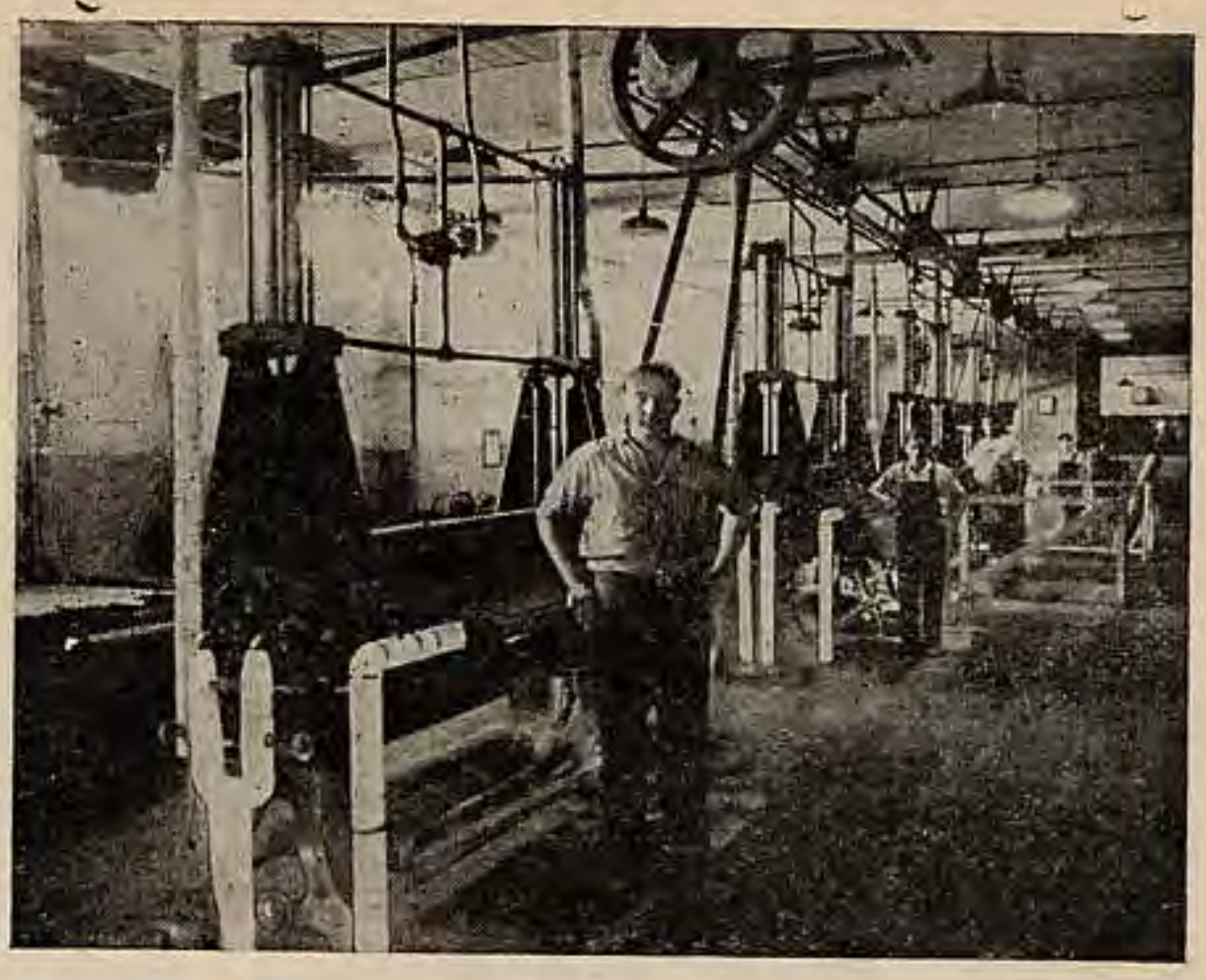
Fig. 1, above left: The tool room. Fig. 2, left: The automatic screw-machine department. Fig. 3, below: The punch-press department.

Fig. 2 shows the screw-machine depart-



ment. The long rods of brass, steel, etc., are fed into one end of a screw machine which automatically forms, threads, taps, and cuts off the part which it is tooled up to make.

One operator can take care of several of these machines. The screw-machine department turns out millions of small parts such as thumb nuts, screws, condenser shafts, condenser posts, metal inserts for Bakelite dials and knobs, dial bearings, etc. Almost any Pilot part contains one or more parts which were made by a screw machine. This department operates on a 24-hour schedule during most of the year. A degree of accuracy is maintained that is not equalled in many so-called precision shops.



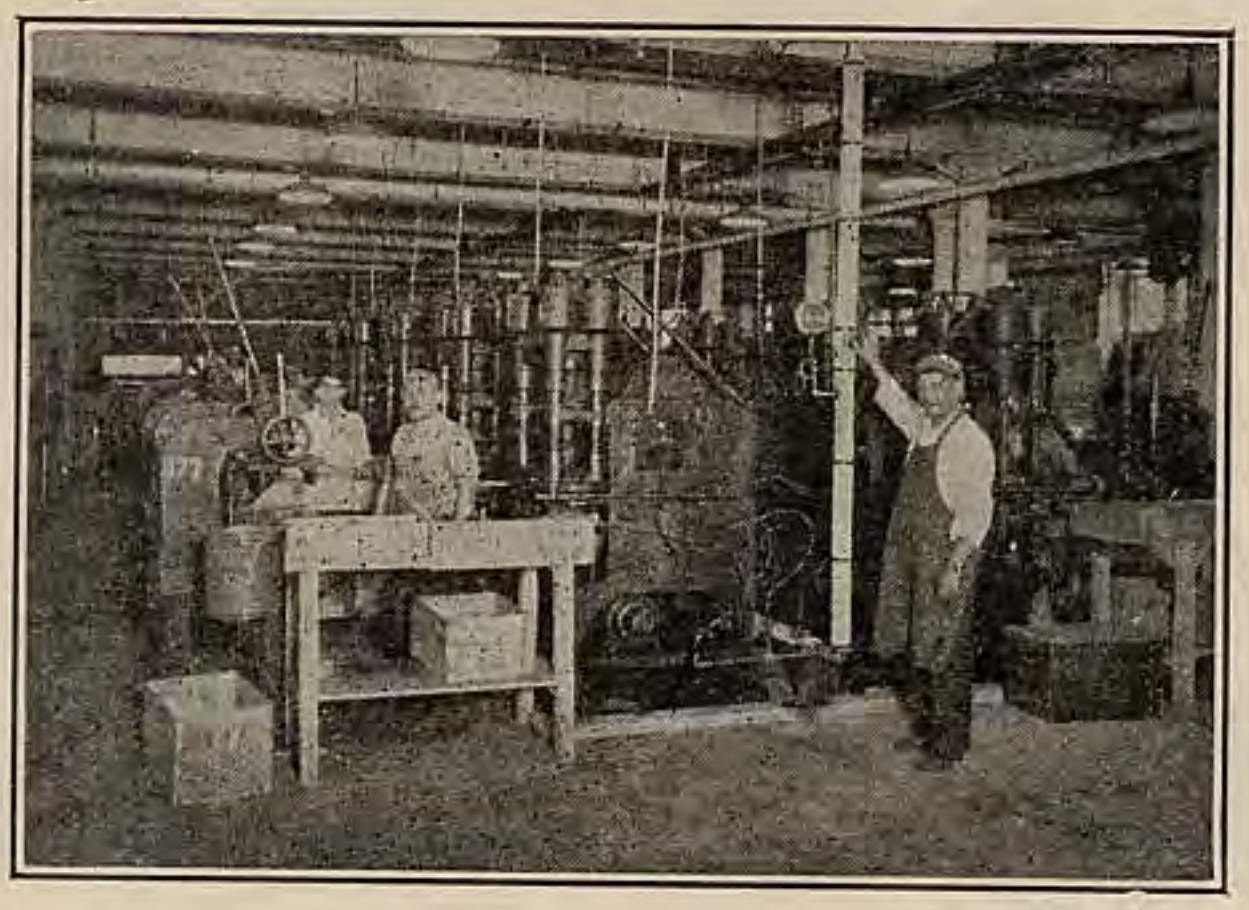


Fig. 6, above right: Machines for rolling Formalite tubing. Fig. 5, right: Section of bakelite molding department. Fig. 4, below: Giant punch presses.

Fig. 3 shows a section of the punch-press department. These presses are used for punching out the smaller parts, such as tube-socket prongs, tinfoil plates for Micrograd fixed condensers, smaller parts for power pack and transformer cans, small condenser plates, etc. Forty of these presses are employed in the department. These are supplemented by a large number of smaller presses used in the various assembling departments throughout the factory.

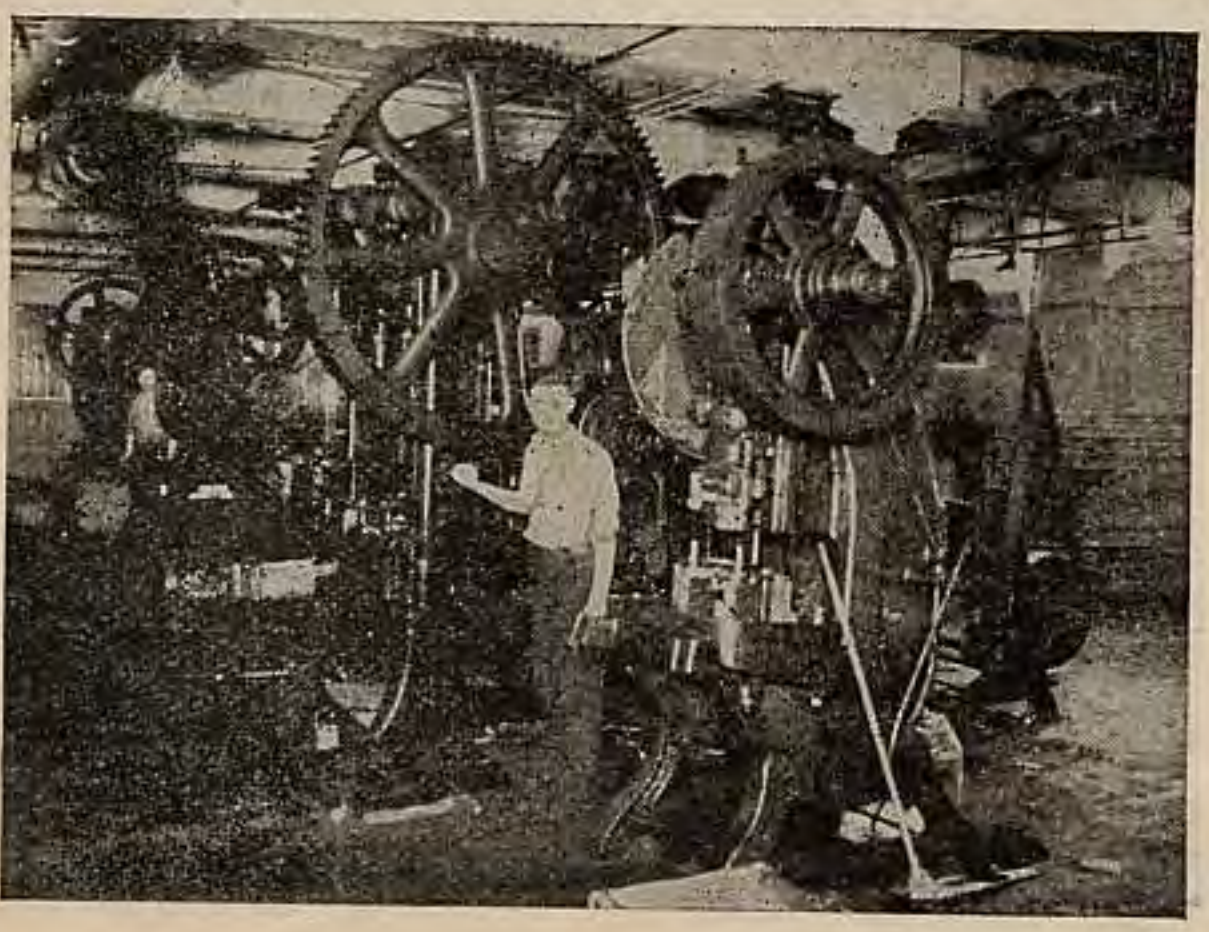
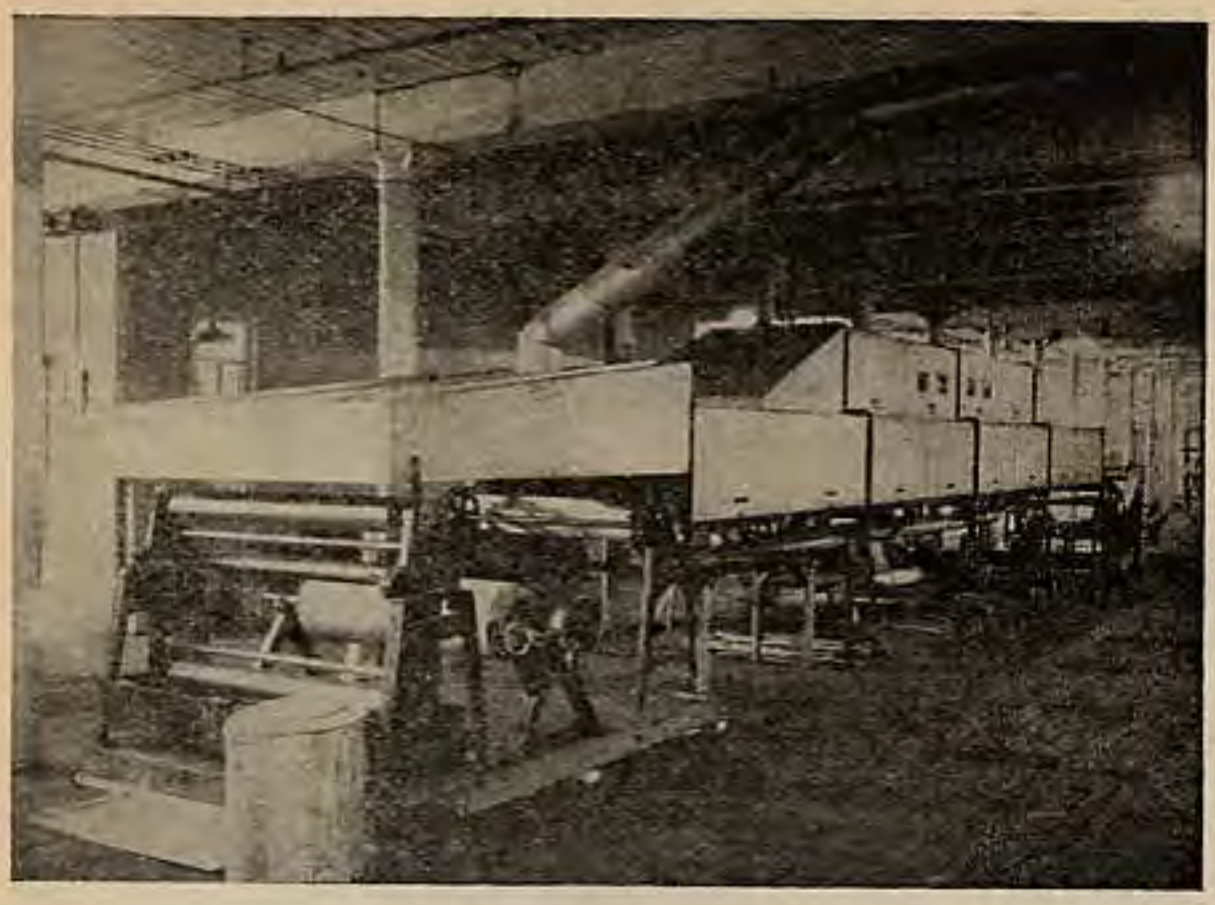


Fig. 4 shows a few of the giant draw-presses used for drawing the steel transformer cans, shielding cans, power-pack can covers, Vaultype condenser shields, etc., from single pieces of metal. The larger geared draw press in the picture stands 12 feet high and has a specially built body, and a 7-inch crank. These presses are also used for punching out the various holes and slots in the large size sub-panels employed in the various Pilot kits. Supplementing these (not shown in the photo) are three automatic presses, one of 50 tons capacity, and two of 25 tons capacity each, which automatically stamp out thousands of transformer

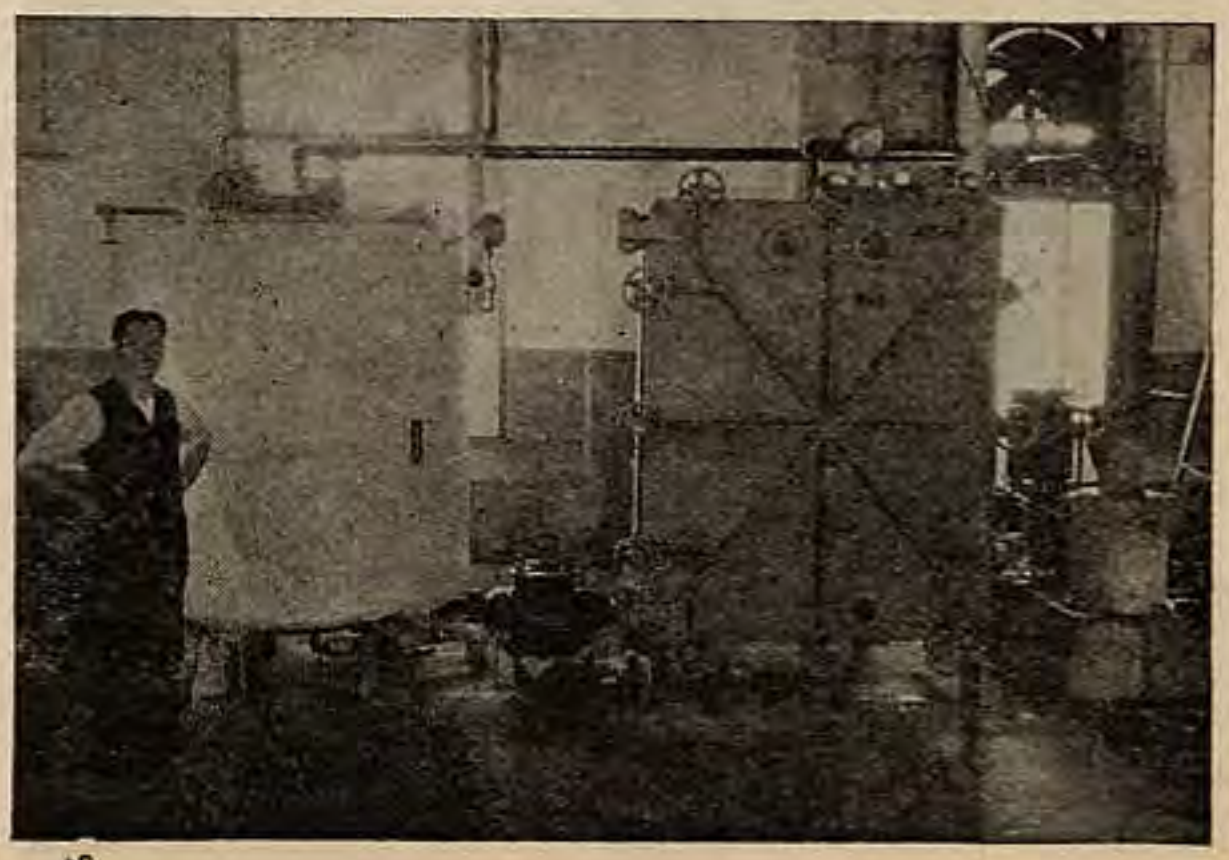


laminations, variable condenser plates, and other metal parts from long strips of metal. These presses rapidly and cleanly punch out the steel, brass, or aluminum parts as though they were made of soft cheese. One can only appreciate how perfectly they do their work if he has ever tried to cut out a condenser plate or a transformer lamination by hand with a pair of shears.

All Pilot Bakelite parts, panels, and tubing are produced in the molding department. At the rear is a dust-proof room where the Bakelite powder is pre-formed into molding pills (as described in the Vol. 2, No. 3, issue of RADIO DESIGN). Pilot is one of the largest single users of Bakelite, for every molded part in Pilot equipment is made of genuine Bakelite. Fig. 5 shows batteries of the large Terkelson mechanical presses used for molding dial drums, plug-in coil forms, transformer cases, etc. (The operation of all of this equipment was explained by the writer in the article referred to above). In these presses, the Bakelite powder (or pre-molds) is inserted in the cavities of the special steel molds, which are subjected to a temperature of 350 degrees Fahrenheit and a pressure of 2000 lbs. per square inch to complete the chemical change which changes the powder to Bakelite, having the exact shape of the mold. Even the minute markings and graduations on dials and knobs are produced in the molding operation as accurately as though machined. Multiple cavity dies are employed in which as many as 60 pieces are molded at once, depending on their size. This reduces the unit cost of the parts.

Fig. 6 shows the machines used to roll up the impregnated paper used for making Formalite tubing. The treated paper is rolled on steam-heated mangles in these machines to form tubes about 42 inches long. These are then placed into one end of the oven shown in Fig. 7. A moving conveyor carries the tubes through the entire length of this machine, during which time they are exposed to certain temperatures and

Fig. 7, above left: Oven for impregnating tubing. Fig. 8, left: Condenser winding machine. Fig. 9, below, condenser impregnation tanks.



processes for making a homogeneous tubing which is a good moisture-proof electrical insulator. This same oven is used for impregnating the raw paper before it is rolled up into tubes on the mangles of Fig. 6. A roll of paper can be seen in place on the front of the machine. The temperature and exact operating conditions of the oven are automatically controlled by delicate apparatus developed especially for it.

Fig. 8 shows four of the special dust-proof winding machines developed by the Pilot engineers for winding the paper and tinfoil sheets of the by-pass and filter condensers. The dust-proof cover has been removed from one of the winders to show its construction more clearly. Not content with the dust-proof construction of these machines, the Pilot engineers laid out a special dust-proof room in which these machines are operated. All air entering this room is first freed from every trace of dust. This is necessary in order to insure freedom from condenser breakdown due to conducting dust particles being wound in with the paper and tinfoil strips and causing short circuits later.

Fig. 9 shows one of the fixed condenser and coil impregnating units consisting of a heated paraffin storage tank and impregnating oven. Briefly, the condensers are first stacked in the hermetically sealed oven on the right and squeezed at the

Fig. 12, above: Stem assembly branch, tube division.
Fig. 11, below: General parts assembly.

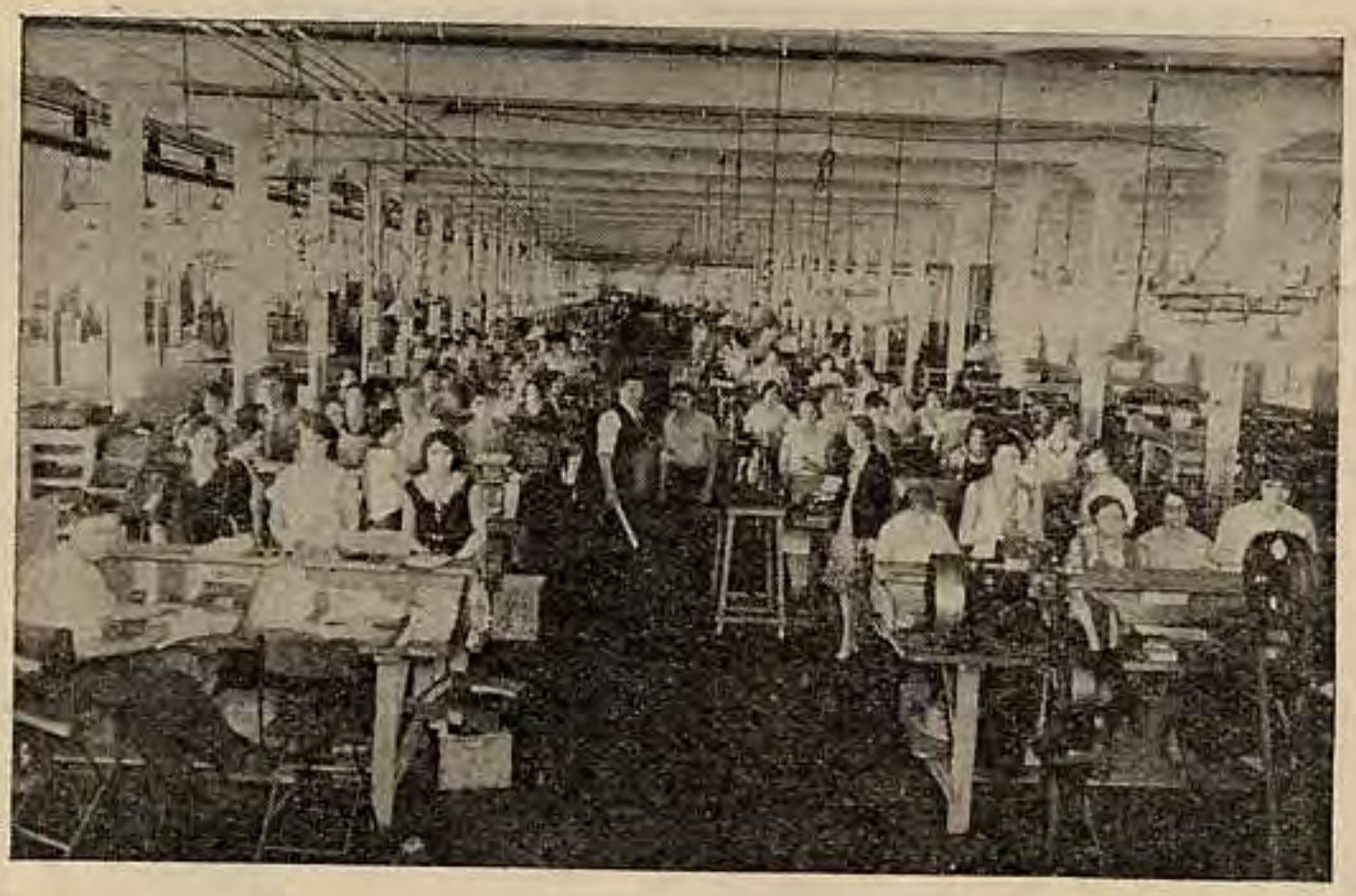


Fig. 10, below: Transformer winding machines.

proper pressure. Then all of the air is pumped out of the oven while the condensers are kept at a definite temperature. This is to remove all moisture and air bubbles from between the plates. Then the paraffin wax which has been melted and heated in the tank at the left is forced under high pressure into the oven at the right. The pressure forces the paraffin to thoroughly inpregnate the entire condenser and make it absolutely moisture proof. The surplus paraffin is then pumped back into the tank and the condensers are removed and tested. An idea of the large size of both tank and oven can be obtained by comparison with the height of a man standing alongside. All transformer coils are also impregnated in equipment similar to this.

Fig. 10 shows part of the automatic machines used to wind Pilot audio and power transformers and choke coils. Fourteen coils are wound simultaneously. Each layer is insulated by a wrapping of waxed paper, in order that coils may safely withstand high voltages. These machines are designed to provide an even tension on the wire while it is being wound. The exact amount of tension which eliminates danger of loose windings or breakage of wire has been determined by the Pilot engineers after long experience.

Fig. 11 shows a portion of the general assembly department where miscellaneous small parts —such as drum dials, rheostats, small resistors, tube sockets, Resistograds, etc.—are assembled from the component parts which have been fabricated by the automatic-screw machines department, Bakelite molding department, punch-press department, etc. The assembly benches are laid out so the work passes from one girl to the next for the various operations without loss of time or excessive handling.

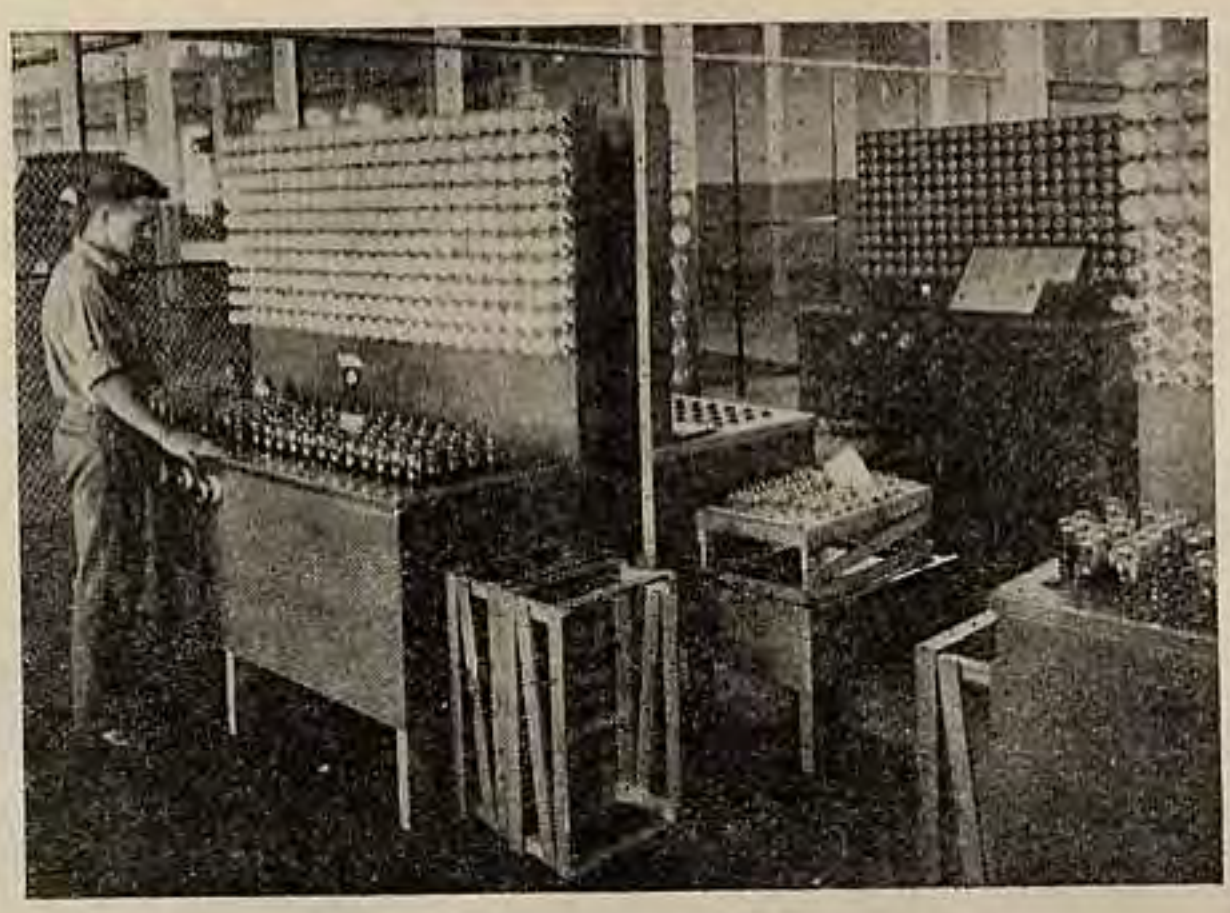


Fig. 13, above left: Evacuating and flashing machinery. Fig. 14, left: Ageing racks. Fig. 15, below: Life-test racks with automatic ***switches.***

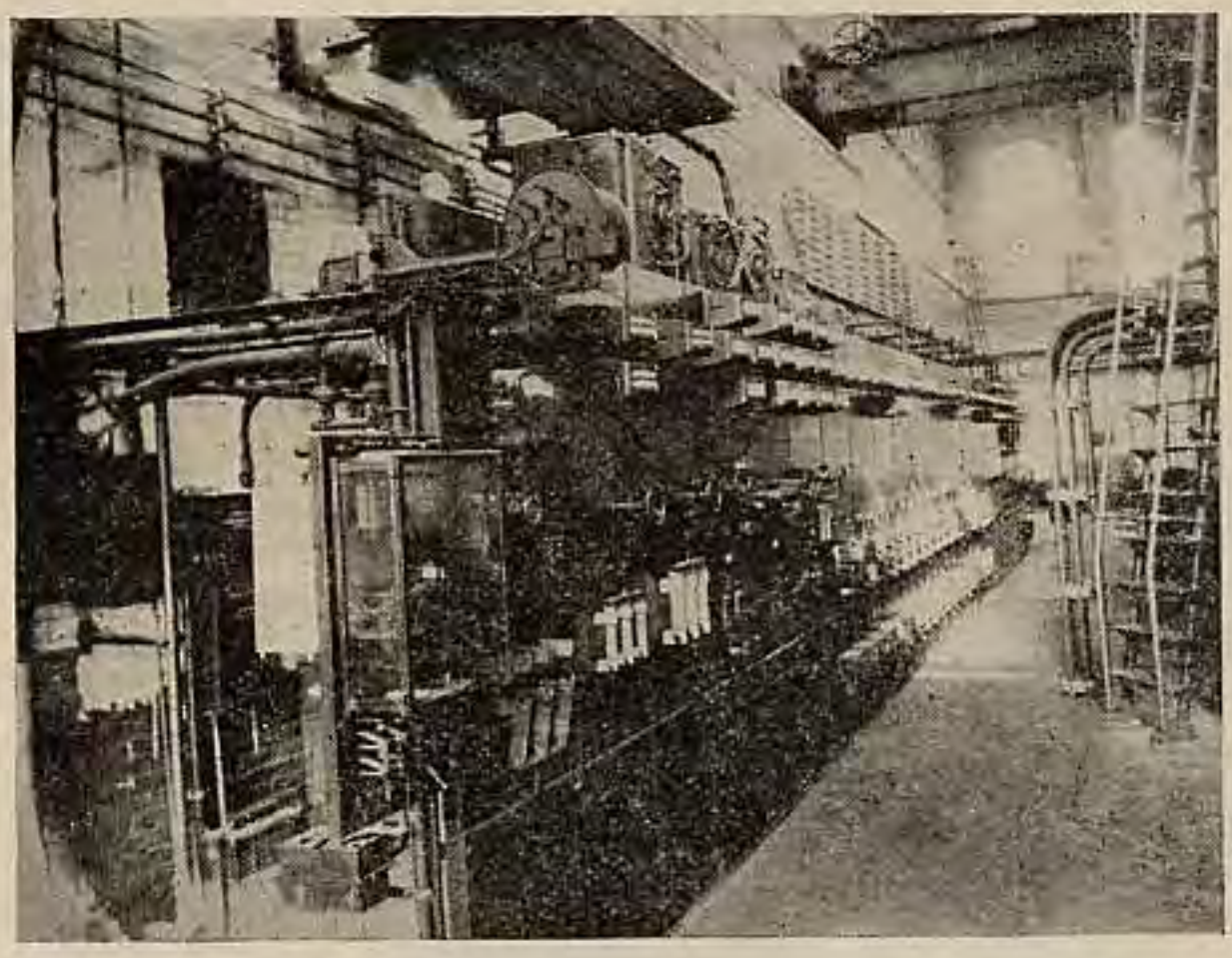
The demand for Pilotron tubes has in-

creased so rapidly that the facilities for their manufacture have been greatly enlarged in the new plant.

In Fig. 12 we see a portion of the stem assembly department, where the various stages of the element, lead-in wire and stem assembly are carried out. (The details of the manufacture of Pilotron tubes were explained by the writer in an article in the Vol. 2, No. 4, issue of RADIO DESIGN.) At the right in Fig. 12 are shown several of the automatic sealing machines which seal the stem and element assembly to the outer bulb.

The tubes are evacuated, flashed or bombarded, and sealed automatically by the machines shown in Fig. 13. At each machine the battery of special motor driven high vacuum pumps are arranged along the floor. Above is the bombarding equipment and back of this is the rotating turntable which carries the tubes around to their successive positions in the process. The entire machine is operated by a single operator who merely places the tubes in the holders and removes the evacuated tubes as they come around to her.

While these illustrations do not show every detail of the equipment in the new quarters, we trust they will serve to give our many readers an insight into the equipment and facilities which are being used solely in the manufacture of radio parts and tubes. An additional section of the new Pilot plant is to be devoted entirely to the manufacture of a new line of completely wired and assembled sets.



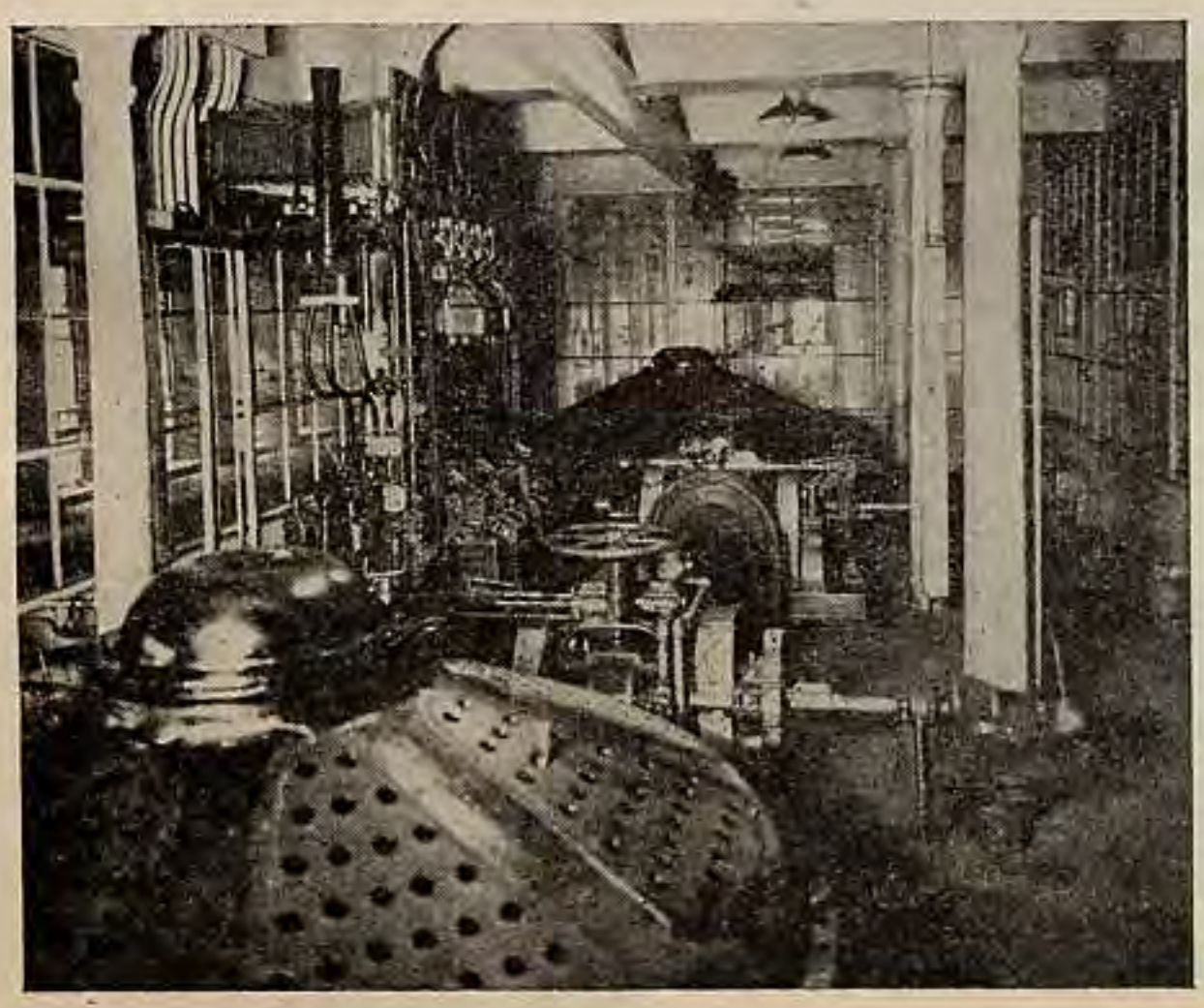


Fig. 18, above right: Part of the office. Fig. 17, right: Switchboard in power house. Fig. 16, below: Water wheel generators in power house.